SNIA Emerald™ Version 3.0 Taxonomy

Patrick Stanko
Consultant for SNIA

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Why have a storage taxonomy for SNIA Emerald™

- Need a fair comparison among similar products
  - Able to compare power performance trade offs
  - Online (Random fast access) vs. Tape (sequential low power)
- Similar green metrics may apply to all product categories/classifications but different values establish best-in-class
  - Online 2 vs. Online 4

- Unique considerations apply to special categories
  - VML systems designed for sequential workloads only
- A clear taxonomy will simplify comparisons / trade offs
- Help customers predict power usage in their IT environment

SNIA Emerald™ Storage Taxonomy for Version 3 Specification

Disclaimer

- This is a working draft and information presented here is work in progress
- The SNIA Green TWG does not anticipate any major changes of the Storage Taxonomy as it is presented here
- The Taxonomy for Version 3 of the specification may change between now and the final release of the specification

SNIA Emerald™ Storage Taxonomy Categories for Version 3

Common Attributes (High Level Division)

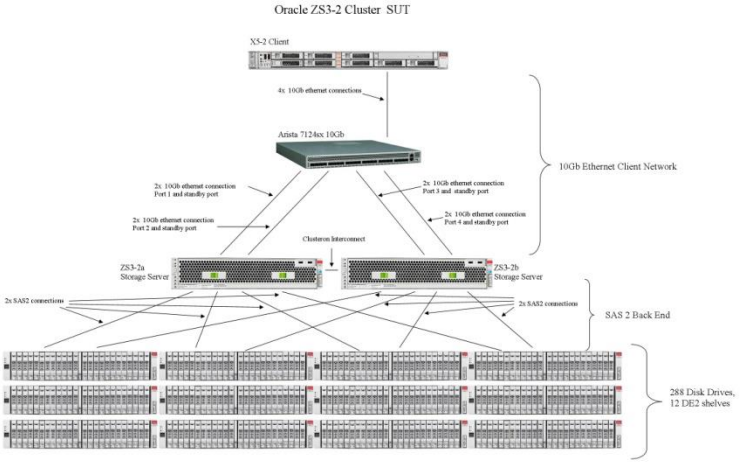
- Categories did not change for version 3
  - Online
  - Near-Online
  - Removable Media Library
  - Virtual Media Library

File Systems fall into the Online Category

Attribute	Category			
	Online	Near-Online	Removable Media Library	Virtual Media Library
Access Pattern	Random/ Sequential	Random/ Sequential	Sequential	Sequential
MaxTTFD (t) [a]	t < 80 ms	t > 80 ms	t > 80 ms t < 5 min	t < 80 ms
User Accessible Data	Required	Required	Required	Required

File Systems fit into existing SNAI Emerald™ Storage Taxonomy

- File systems fall into Online Category
  - Controller and storage devices
  - File operations have random and sequential components
  - No need to generate a new Category
  - Added a classification attribute



Configuration diagram of
Oracle ZS3-2 SPEC SFS2014 VDA submission

Online Classification SNIA Emerald™ Storage Taxonomy for Version 3

- Basically the same as version 2.1 (difference highlighted in blue)
- Added Stable Storage Support
  - Added for File Systems (SPEC SFS2014)
  - Storage that retains its content over power failures
- Footnote added to Maximum Supported Configuration
  - Removed requirement for solid state system that is not based on replaceable storage devices

Attribute	Classification					
	Online 1	Online 2	Online 3	Online 4	Online 5	Online 6
Access Pattern	Random/ Sequential	Random/ Sequential	Random/ Sequential	Random/ Sequential	Random/ Sequential	Random/ Sequential
MaxTTFD (t)	t < 80 ms	t < 80 ms	t < 80 ms	t < 80 ms	t < 80 ms	t < 80 ms
User-Accessible Data	Required	Required	Required	Required	Required	Required
Connectivity	Not specified	Connected to single or multiple hosts	Network-connected	Network-connected	Network-connected	Network-connected
Consumer/ Component	Yes	No	No	No	No	No
Integrated Storage Controller	Optional	Optional	Required	Required	Required	Required
Storage Protection	Optional	Optional	Required	Required	Required	Required
No SPOF	Optional	Optional	Optional	Required	Required	Required
Stable storage support	Optional, unless required by protocol	Optional, unless required by protocol	Required	Required	Required	Required
Non-Disruptive Serviceability	Optional	Optional	Optional	Optional	Required	Required
FBA/CKD Support	Optional	Optional	Optional	Optional	Optional	Required
Maximum Supported Configuration[1]	≥1	≥ 4	≥ 12	> 100	>400	>400

Market cross reference SNIA Emerald™ Storage Taxonomy for Version 3

- Market cross reference
  - Same as version 2.1
  - Range from
    - Consumer / Component
    - High-end/Mainframe

Category Level	**Online** (see 5.3)	**Near-Online** (see 5.4)	**Removable Media Library** (see 5.5)	**Virtual Media Library** (see 5.6)
Consumer/ Component [a]	Online 1	Near- Online 1	Removable 1	Virtual 1
Low-end	Online 2	Near- Online 2	Removable 2	Virtual 2
Mid-range	Online 3	Near- Online 3	Removable 3	Virtual 3
	Online 4			
High-end	Online 5	Near- Online 5	Removable 5	Virtual 5
Mainframe	Online 6	Near- Online 6	Removable 6	Virtual 6

[a] Entries in this level of taxonomy include both consumer products and data-center components (e.g., stand-alone tape drives)

Highlighted Changes to SNIA Emerald™ Storage Taxonomy Categories for Version 3

- File systems will fall into the Online category
- Added requirement for stable storage
- Removed drive count requirement for solid state system that is not based on replaceable storage devices
- The other categories and classifications did not change

SNIA Emerald™ Storage Taxonomy Beyond Version 3

- Will need a high level division
  - Review and approval of the Categories is a top priority of the Green TWG for the next revision of the SNIA Emerald™ specification
  - New categories could be considered (Storage Server)
- How much fine level division?
  - Do we need to have six levels of division in the future?
  - Do we need to have a division along drive types?
  - Break points along RAS (reliability/ availability / serviceability)